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Development of Family of Pipes Lines Inspection Robots

ABSTRACT

This paper concerns the development of a family of robots for pipelines inspection. Pipes are used in many different situations, for example to supply water and gas in urban centers or to circulate air in HVAC systems, not to mention diverse industrial applications. Pipelines should be inspected from time to time and robots are frequently used to perform this task. However, the diversity of diameters, paths and environmental conditions make it difficult for a single robot to adapt itself to all these situations. With this in view, a family of robots was developed to overcome these limitations. The design was based on a concurrent engineering approach together with the application of many DF-X statements such as modular design, design for assembly, manufacturing, maintainability, control and others. This paper presents all the steps involved in the system development from the formulation of design specifications to the execution of performance tests in the field

Introduction

Pipe lines has high level of standarization and the variation on diameter, material and assembly they will differs mainly on diameter, path and aggressiveness. Inspite of this all of then must be inspected since its assembly, and periodically throw its life time. In order to attain diferrent requirements a family of robots was developed.

The Design Process

The desgin process started following the recommendation of VDI 2221, 2222, 2224, Pahl & Beitz [1] and Krauser [2,3] but during the first steps was detected the necessity to improve the

design process and make it more dynamic in order to save time and reduce costs. The design development was done using a new approach based on concurrent engineering and applying many DF-X statements, as modular design, design for assembly, manufacturing, maintenance, control and others.

Following the design approach proposed by Rosenfeld, Forcellini et al [3], the conceptual design was brought into informational design, and both tasks were developed in parallel, one complementing the other in a concurrent like engineering. During the requirements survey an association with a correspondent DF-X were done, this allowed to improve the dynamic and the systematic to functional and detailed design.

Since the design requires different engineering skills, so the development was carried out by a mechanical and an electronics development teams, on three different universities, set apart from 800 km each one. The design management was done using internet resources for on line conference and meeting, with a common data base. The control and tracking devices were also developed in a concurrent manner, with the mechanical and electronic teams carrying through all the design task together.

Conclusion

After the detailed design a pre-series of robots was manufactured and tested on different environments. Those tests were done in order to collect data to feed back the design process. The results shown that only minor corrections were necessary, and the design approach used in the development shown to be very dynamic on provide information, coordination and answers the development team.

References:

- [1] PAUL, G.; BEITZ, W. Engineering Design – a Systematic Approach. Londres: Spring Verlag, 1996.
- [2] KRAUSE, W. Geräte Konstruktion in Feinwerktechnik und Elektronik, Fachbuchverlag Leipzig, 2000
- [3] KRAUSE, W. Konstruktionselemente der Feinmechanik, Hanser Fachbuchverlag, 2004
- [4] ROSENFELD, H., FORCELLINI, F. A., et. al. Projeto de Desenvolvimento de Produto, 2005

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